



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
ADDRESS: COMMISSIONER OF PATENTS AND TRADEMARKS
WASHINGTON, D.C. 20514
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/987,660	11/15/2001	Yasushi Iyechika	2185-0589P-SP	7521

2292 7590 07/31/2002

BIRCH STEWART KOLASCH & BIRCH
PO BOX 747
FALLS CHURCH, VA 22040-0747

EXAMINER

TRAN, LONG K

ART UNIT	PAPER NUMBER
----------	--------------

2818

DATE MAILED: 07/31/2002

6

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/987,660

Applicant(s)

IYECHIKA ET AL.

Examiner

Long K. Tran

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f):
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* If not checked, the Office will not conduct a search of the certified copies not received.

* Translation of foreign language material must be submitted with the application.

- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and 121.

Attachment(s)

- 1) ☐ A copy of the application as filed with the International Bureau (PCT Rule 17.2(a)).
- 2) ☐ A copy of the application as filed with the International Bureau (PCT Rule 17.2(a)).

DETAILED ACTION

Priority

1. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed.

Specification

2. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. **Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification and the claims.**

Claim Objections

3. Claim 2 objected to because of the following informalities: the layers in the claim should be teaching in order: first layer (line 4) then second layer (line 2). Appropriate correction is required.
4. Claim 5 objected to because of the following informalities: the second layer and the third layer are disclosed in the claim. However, the first layer has not been disclosed.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language, or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

6. Claims **1- 6** and **8** are rejected under 35 U.S.C. 102(e) as being anticipated by Iyechika et al. (US Patent No. 6,023,077).

Regarding claim **1**, Iyechika et al. disclose a III-V group compound semiconductor represented by the general formula $\text{In}_x\text{Ga}_y\text{Al}_z\text{N}$ ($x+y+z=1$, $0 \leq x \leq 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$) in which the concentration of an n-type carrier is $1 \times 10^{19} \text{ cm}^{-3}$ or less, wherein the concentration of a p-type dopant is $1 \times 10^{17} \text{ cm}^{-3}$ or more and $1 \times 10^{21} \text{ cm}^{-3}$ or less. See col. 2, lines 44+; col. 5, lines 17-19; col. 8, lines 1 - 14.

Regarding claim **2**, Iyechika et al. disclose a III-V group compound semiconductor having a structure in which a second layer 5 (figs. 1,3-4) composed of a III-V group compound semiconductor represented by the general formula $\text{In}_u\text{Ga}_v\text{Al}_w\text{N}$ ($u+v+w=1$, $0 \leq u \leq 1$, $0 \leq v \leq 1$, $0 \leq w \leq 1$) is adjacent to a first layer 4 (figs. 1,3-4) composed of a III-V

cm^{-3} or less, wherein the concentration of a p-type dopant is $1 \times 10^{17} \text{ cm}^{-3}$ or more and 1

Art Unit: 2818

$\times 10^{21} \text{ cm}^{-3}$ or less, and the band gap is larger than that of said second layer. See col. 2, lines 44+; col. 3, lines 44+; col. 8, lines 1 – 13; col. 10, lines 41 – 56.

Regarding claim 3, Iyechika et al. disclose a III-V group compound semiconductor having a structure in which a layer 6 (figs. 1,3-4) composed of a III-V group compound semiconductor represented by the general formula $\text{In}_x\text{Ga}_y\text{Al}_z\text{N}$ ($x+y+z=1$, $0 \leq x \leq 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$) in which the concentration of an n-type carrier is $1 \times 10^{19} \text{ cm}^{-3}$ or less, wherein the concentration of a p-type dopant is $1 \times 10^{17} \text{ cm}^{-3}$ or more and $1 \times 10^{21} \text{ cm}^{-3}$ or less is adjacent to a layer 7 (figs 1,3-4) composed of a p-type II-V group compound semiconductor represented by the general formula $\text{In}_a\text{Ga}_b\text{Al}_c\text{N}$ ($a+b+c=1$, $0 \leq a \leq 1$, $0 \leq b \leq 1$, $0 \leq c \leq 1$). See col. 5, lines 20-27; col. 8, lines 1 – 13; col. 10, lines 41 – 56.

Regarding claim 4, Iyechika et al. disclose a III-V group compound semiconductor having a structure comprising at least one layer 6 (figs. 1,3-4) composed of a III-V group compound semiconductor represented by the general formula $\text{In}_x\text{Ga}_y\text{Al}_z\text{N}$ ($x+y+z=1$, $0 \leq x \leq 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$) in which the concentration of an n-type carrier is $1 \times 10^{19} \text{ cm}^{-3}$ or less, wherein the concentration of a p-type dopant is $1 \times 10^{17} \text{ cm}^{-3}$ or more and $1 \times 10^{21} \text{ cm}^{-3}$ or less, between a layer 5 (figs. 1,3-4) composed of a III-V group compound semiconductor represented by the general formula $\text{In}_u\text{Ga}_v\text{Al}_w\text{N}$ ($u+v+w=1$, $0 \leq u \leq 1$, $0 \leq v \leq 1$, $0 \leq w \leq 1$) and a layer 7 (figs. 1,3-4) composed of a p-type III-V group compound semiconductor represented by the general formula $\text{In}_a\text{Ga}_b\text{Al}_c\text{N}$ ($a+b+c=1$, $0 \leq a \leq 1$, $0 \leq b \leq 1$, $0 \leq c \leq 1$).

having a structure comprising a second layer 5 (figs. 1,3-4) composed of a III-V group

Art Unit: 2818

compound semiconductor represented by the general formula $\text{In}_u\text{Ga}_v\text{Al}_w\text{N}$ ($u+v+w=1$, $0 \leq u \leq 1$, $0 \leq v \leq 1$, $0 \leq w \leq 1$) carrying thereon a laminated layer 4 (figs. 1,3-4) composed of an n-type III-V group compound semiconductor represented by the general formula $\text{In}_p\text{Ga}_q\text{Al}_r\text{N}$ ($p+q+r=1$, $0 \leq u \leq 1$, $0 \leq v \leq 1$, $0 \leq w \leq 1$) having larger band gap than that of said second layer, and at least one layer composed of a III-V group compound semiconductor represented by the general formula $\text{In}_x\text{Ga}_y\text{Al}_z\text{N}$ ($x+y+z=1$, $0 \leq x \leq 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$) in which the concentration of an n-type carrier is $1 \times 10^{19} \text{ cm}^{-3}$ or less, wherein the concentration of a p-type dopant is $1 \times 10^{17} \text{ cm}^{-3}$ or more and $1 \times 10^{21} \text{ cm}^{-3}$ or less, between said layer 3 (figs. 1,3-4) composed of the n-type III-V group compound semiconductor and a third layer 7 (figs. 1,3-4) composed of a p-type III-V group compound semiconductor represented by the general formula $\text{In}_a\text{Ga}_b\text{Al}_c\text{N}$ ($a+b+c=1$, $0 \leq a \leq 1$, $0 \leq b \leq 1$, $0 \leq c \leq 1$) on the opposite side to said second layer 5 (figs. 1,3-4). See col. 9, lines 58+.

Regarding claim 6, Iyechika et al. disclose the P-type dopant is Mg and/or Zn (col.9, lines 8-12).

Regarding claim 8, Iyechika et al. disclose a light emitting device comprising the group III-V compound semiconductor col. 16, line 5-6).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

a. A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

Art Unit: 2818

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iyechika et al. (US Patent No. 6,023,077).

Regarding claim 7, Iyechika et al. disclose a method of producing a III-V group compound semiconductor comprising growing a III-V group compound semiconductor represented by the general formula $\text{In}_x\text{Ga}_y\text{Al}_z\text{N}$ ($x+y+z=1$, $0 \leq x \leq 1$, $0 \leq y \leq 1$, $0 \leq z \leq 1$) in which the concentration of an n-type carrier is $1 \times 10^{19} \text{ cm}^{-3}$ or less, wherein the concentration of a p-type dopant is $1 \times 10^{17} \text{ cm}^{-3}$ or more and $1 \times 10^{21} \text{ cm}^{-3}$ or less, using a metal organic vapor phase growth method (col.11, lines 35+). However Iyechika et al. does not explicitly teach the temperature of 600°C or more and 950°C or less.

It would have been obvious to one having ordinary skill in the art at the time of the invention was made to set the process temperature of 600°C or more and 950°C or less, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Long K. Tran whose telephone number is 703-305-

Attempts to reach the examiner by telephone are requested. The examiner's supervisor, David Nelms can be reached on 703-308-4910. The fax phone numbers

Application/Control Number: 09/987,660

Page 7

Art Unit: 2818

for the organization where this application or proceeding is assigned are 703-746-7466 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-3329.

Long Tran *WT*

July 24, 2002

HHC
HOAI HC
PRIMARY EXAMINER